## REMARKS

Claims 1-16 were rejected and claims 12 was objected to in the Office Action mailed on April 9, 2007. Claims 1, 4, and 12 are amended. With entry of this Amendment and Response claims 1-16 will be pending and under consideration.

### *In the Claims*

Applicants amended claim 1 to recite "a degree of cold forming of 2.5 to 25%." Support for this amendment can be found, for example, in claim 1 as originally filed and paragraph **[0033]** of the published application. Applicants also amended claim 4 to correct a typographical error (i.e., the spelling of "steel") and claim 12 to change its dependency. Applicants respectfully submit that these amendments do not introduce any new matter.

### *Examiner's Comments*

The Examiner noted that the rejections over Canadian Patent Application No. 2,414,138 ("CA '138") can be overcome by providing satisfactory evidence that the date is in error, as well as the required certified translation of the foreign priority document DE 102 59 230.6 in accordance with 37 C.F.R. § 1.55.

Applicants submit herewith a copy of the Canadian Patent Database entry for Canadian Patent Application No. 2,414,138 showing a publication date of December 19, 2002 as Exhibit A. Applicants also submit herewith a copy of the corrected cover page of Canadian Patent Application No. 2,414,138 showing a publication date of December 19, 2002 as Exhibit B. Applicants respectfully submit that Exhibits A and B provide satisfactory evidence that the date is in error. Furthermore, Applicants Submit a certified translation of the foreign priority document DE 102 59 230.6 in accordance with 37 C.F.R. § 1.55 as Exhibit C.

In view of the foregoing, Applicants respectfully request that all rejections over CA '138 be reconsidered and withdrawn.

### *Objection of Claim 12 Under 37 C.F.R. § 1.75 (c)*

The Office Action objected to claim 12 under 37 C.F.R. § 1.75(c), as being of improper dependent form for failing to limit the subject mater of a previous claim.

Applicants have amended claim 12 to depend upon claim 10 rather than claim 11. Therefore, presently amended claim 12 limits the subject mater of a previous claim. Accordingly, Applicants respectfully request that the objected to claim 12 under 37 C.F.R. § 1.75(c) be reconsidered and withdrawn.

***Double Patenting Rejections***

Claims 1-16 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4 and 9-15 of copending U.S. Application No. 10/344,192 in view of the Metals Handbook, Vol. 1.

Applicants respectfully maintain that that claims 1-16 are patentably distinct from claims 1-4 and 9-15 of copending U.S. Application No. 10/344,192 in view of the Metals Handbook, Vol. 1. However, in order to expedite prosecution, Applicants agree to file appropriate Terminal Disclaimers with respect to copending U.S. Patent Application No. 10/344,192 upon notification of allowable claims.

***Rejection of Claims Under 35 U.S.C. § 103(a)***

***Rejection of Claims 1-16 over CA '138 and Metals Handbook***

The Office Action rejected claims 1-16 under 35 U.S.C. § 103(a), as being unpatentable over CA '138 in view of Metals Handbook, Vol. 1 ("Metals Handbook").

Applicants submit herewith Exhibits A and B, which provide evidence that the date of CA '138 is in error, and Exhibit C, which is a certified translation of the foreign priority document. Applicants respectfully submit that CA '138 is not available as prior art to the present application. Accordingly, Applicants respectfully request that the rejection of claims 1-16 over CA '138 in view of Metals Handbook be reconsidered and withdrawn.

***Rejection of Claims 1-16 over Guelton and Metals Handbook***

The Office Action rejected claims 1-16 under 35 U.S.C. § 103(a), as being unpatentable over U.S. Patent No. 6,358,338 to Guelton et al. ("Guelton") in view of Metals Handbook alone

or in further view of U.S. Patent No. H326 to Brager et al. ("Brager") or Japanese Patent Document 58-144418 (JP '418)[1].

Guelton discloses a strip made of an iron-carbon-manganese alloy and a process for producing the strip, along with specific percentages by weight for C, Mn, Ni, Si, Al, Cr, P, Sn, Sb, As, S, Se, Te, V, Ti, Nb, B, Zr, rare earths, Mo, W, N, Cu, Fe, and impurities. (See Guelton at Abstract and col. 1, ll. 55-65.) Guelton also discloses the alloy is cast directly in the form the strip. (See Guelton at col. 3, ll. 31-39.) Metals Handbook discloses inter alia that in temper rolling, the steel is cold reduced, usually by ½ to 2%. (See Metals Handbook at p. 205, col. 3.) Brager discloses various alloy compositions as percentages by weight for C, Mn, Ni, Si, Al, Cr, P, S, Te, V, Ti, B, W, N, and Fe. (See Brager at Table I.) Brager also discloses cold rolling for reduction in thickness of about 40 to about 60 %. (See Brager at col. 7, ll. 2-8.) JP '418 discloses the manufacture of high manganese steel for non-magnetic use by continuously casting, slow cooling, and hot rolling. (See JP '418 at Abstract.)

Claim 1 is patentable over Guelton in view of Metals Handbook alone or in further view Brager or JP '418 because the cited prior art, either alone or in combination, does not teach or suggest every element of claim 1. For example, the cited prior art does not teach or suggest the element of a degree of cold forming of 2.5 to 25 % of Applicants' presently amended claim 1.

Claim 1 is also patentable over the cited prior art because the element of a degree of cold forming of 2.5 to 25 % of Applicants' presently amended claim 1 would not have been obvious to one skilled in the art at the time of the invention in view of the cited prior art. First, because Guelton teaches direct casting of the alloy rather than cold forming, Guelton teaches away from Applicants' presently amended claim 1. Furthermore, because JP '418 teaches hot rolling, JP '418 also teaches away from Applicants' presently amended claim 1. Second, because Metals Handbook teaches cold forming is usually in a range of ½ to 2 % and because Metals Handbook does not provide any teaching or suggestion to extend that range, the degree of cold forming of 2.5 to 25 % of Applicants' presently amended claim 1 would not have been obvious. Third, because Brager merely discloses cold rolling for reduction in thickness of about 40 to about 60 %, Brager would not provide any motivation to one skilled in the art to modify any of the cited prior art disclosures to produce every element of Applicants' presently amended claim 1.

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[1] Based on the English language Abstract.

For at least the reasons stated above, claim 1 is patentable over the combined teachings of Guelton, Metals Handbook, Brager, and JP '418. Claims 2-16 are also patentable over the combined teachings of Guelton, Metals Handbook, Brager, and JP '418 as being dependent upon claim 1. Accordingly, Applicants respectfully request that the rejection of claims 1-16 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

***Rejection of Claims 1-16 over Brager and Metals Handbook***

The Office Action rejected claims 1-16 under 35 U.S.C. § 103 (a), as being unpatentable over Brager in view of Metals Handbook.

The disclosures of Brager and Metals Handbook are discussed above.

Claim 1 is patentable over Brager in view of Metals Handbook because the cited prior art, either alone or in combination, does not teach or suggest every element of claim 1. For example, the cited prior art does not teach or suggest the element of a degree of cold forming of 2.5 to 25% of Applicants' presently amended claim 1. Furthermore, as discussed above, claim 1 is patentable over the cited prior art because the element of a degree of cold forming of 2.5 to 25% of Applicants' presently amended claim 1 would not have been obvious to one skilled in the art at the time of the invention in view of the cited prior art.

For at least the reasons stated above, claim 1 is patentable over the combined teachings of Brager and Metals Handbook. Claims 2-16 are also patentable over the combined teachings of Brager and Metals Handbook as being dependent upon claim 1. Accordingly, Applicants respectfully request that the rejection of claims 1-16 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

## CONCLUSION

In view of the foregoing, Applicants respectfully submit that claims 1-16 are in condition for allowance and request early favorable action. The Examiner is welcome to contact Applicants' Attorney at the number below with any questions.

Respectfully submitted,

Date: October 9, 2007
Reg. No.: 56,471

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Attachments: Exhibits A, B, and C

# Canadian Patents Database

(12) **Patent Application:** (11) **CA 2414138**

(54) HIGHLY STABLE, STEEL AND STEEL STRIPS OR STEEL SHEETS COLD-FORMED, METHOD FOR THE PRODUCTION OF STEEL STRIPS AND USES OF SAID STEEL

(54) ACIER ET FEUILLARD OU TOLE D'ACIER A RESISTANCE TRES ELEVEE, POUVANT ETRE FORME A FROID, PROCEDE POUR PRODUIRE UN FEUILLARD D'ACIER ET UTILISATIONS D'UN TEL ACIER

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ABSTRACT:

The invention relates to steel strips or steel sheets exhibiting good cold forming ability and increased stability, comprising a light steel, which contains (in wt. %) C: <=1.00 %, Mn: 7.0030.00 %, Al: 1.00 10.00 %, Si: > 2.50 8.00 %, Al + Si: > 3.50 12.00 %, B: > 0.00 - < 0.01 %, and optionally Ni: < 8.00 %, Cu: < 3.00 %, N: < 0.60 %, Nb: < 0.30 %, Ti: < 0.30 %, V: < 0.30 %, P: < 0.01 %, the remainder being iron and unavoidable impurities.

CLAIMS: Show all claims

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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(54) Titre : ACIER ET FEUILLARD OU TOLE D'ACIER A RESISTANCE TRES ELEVEE, POUVANT ETRE FORME A FROID, PROCEDE POUR PRODUIRE UN FEUILLARD D'ACIER ET UTILISATIONS D'UN TEL ACIER

(54) Title: HIGHLY STABLE, STEEL AND STEEL STRIPS OR STEEL SHEETS COLD-FORMED, METHOD FOR THE PRODUCTION OF STEEL STRIPS AND USES OF SAID STEEL

(57) Abrégé/Abstract:
The invention relates to steel strips or steel sheets exhibiting good cold forming ability and increased stability, comprising a light steel, which contains (in wt. %) C: ≤ 1.00 %, Mn: 7.0030.00 %, Al: 1.00 10.00 %, Si: > 2.50 8.00 %, Al + Si: > 3.50 12.00 %, B: > 0.00 - < 0.01 %, and optionally Ni: < 8.00 %, Cu: < 3.00 %, N: < 0.60 %, Nb: < 0.30 %, Ti: < 0.30 %, V: < 0.30 %, P: < 0.01 %, the remainder being iron and unavoidable impurities.

## Affidavit of Accuracy

This is to certify the following documents: **DE10259230.pdf - German Patent**, has been translated from German into English by staff members of TransPerfect Translations familiar with both the German and English languages and is to the best of our knowledge, ability and belief, a true and accurate translation.

Kiran Patel
For TransPerfect Translations

Sworn to before me this
Tuesday, October 09, 2007

Signature, Notary Public

(19) Federal Republic of Germany
German Patent and Trademark Office

(10) **DE 102 59 230 A1** 2004.07.15

(12) # Unexamined Patent Application

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Examination request is filed according to § 44 of the [German] Patent Law

**The following text is taken from documents filed by the applicant**

(54) Title: **Method for Production of a Steel Product**

(57) Summary: The invention offers a method that permits reliable production of steel products from a light steel. The steel products according to the invention have an isotropic deformation behavior at high yield points and are ductile at low temperature. This is solved according to the invention by a method for production of a steel product, especially a steel sheet or strip in which a steel strip or sheet is produced from a steel that contains (in wt%): C: ≤1.00%, Mn: 7.00-30.00%, Al: 1.00-10.00%, Si: >2.50-8.00%, Al + Si: >3.50-12.00%, B: <0.01%, Ni: <8.00%, Cu: <3.00%, N: <0.60%, Nb: <0.30%, Ti: <0.30%, V: <0.30%, P: <0.01% and as remainder iron and unavoidable contaminants, from which the steel product is produced in finished form by cold forming occurring with a degree of cold forming from 2 to 25%.

[1] Dr.-Ing. = doctorate in engineering

[2] Dipl.-Ing. = graduate in engineering

**Description**

[0001] The invention concerns a method for production of a steel product having a high yield point. The product according to the invention, in particular, can be a steel sheet or steel strip.

[0002] A light steel used for production of auto body components and low-temperature use is known from DE 197 27 759 C2. In addition to Fe, it contains 10 to 30% Mn, 1 to 8% Al and 1 to 6% Si, the sum of the Al and Si content not surpassing 12%. Carbon is also contained in this known steel in the contaminant range.

[0003] On the other hand, in the light structural steel known from DE 199 00 199 A1 carbon is prescribed as a optional alloying element. The known light steel contains >7 to 27% Mn, >1 to 10% Al, >0.7 to 4% Si, <0.5% C, <10% Cr, <10% Ni and <0.3% Cu. In addition, N, V, Nb, Ti, P to be contained in the steel, the sum of these elements not surpassing 2%.

[0004] Steels of the type just mentioned exhibit TWIP properties (twinning-induced plasticity). This property means that they have high ductility with good strength and low weight at the same time. An extremely high product of tensile strength and elongation can therefore be determined accordingly for TWIP light structural steels. The minimum yield point in steel sheets produced from known TWIP light structural steels ordinarily lies in the range from 260 to 330 MPa.

[0005] Even higher yield points with good deformability at the same time can be achieved, for example, in TRIP steels (transformation-induced plasticity) or in steels in which TWIP and TRIP properties are mixed. All variants of known sheets produced from light structural steels at this time, however, exhibit specific property shortcomings, if they have yield points of more than 330 MPa. For example, scatter in the brittle-ductile transition temperature, temperature dependence of the properties or anisotropic deformation behavior can occur.

[0006] The task of the invention was therefore to provide a method that permits reliable production of steel products from light steels that also exhibit isotropic deformation behavior at high yield points and are ductile at low temperature.

[0007] This task is solved by a method for production of a steel product, especially a steel sheet or strip,

– in which a steel strip or sheet is produced from a steel that contains (in wt%):

| | |
|---|---|
| C: | ≤1.00%, |
| Mn: | 7.00-30.00%, |
| Al: | 1.00-10.00%, |
| Si: | >2.50-8.00%, |
| Al + Si: | >3.50-12.00%, |
| B: | <0.01%, |
| Ni: | <8.00%, |
| Cu: | <3.00%, |
| N: | <0.60%, |
| Nb: | <0.30%, |
| Ti: | <0.30%, |
| V: | <0.30%, |
| P: | <0.01%, |

and iron and unavoidable contaminants as remainder,

– from which a steel product is then produced as finished product by cold forming occurring with a degree of cold forming from 2 to 25%.

[0008] According to the invention high yield points of the finished steel products are adjusted by a cold forming process to which the steel strip is subjected after it is passed through the usual steps of steel strip production. Starting from light steels with the composition stipulated according to the invention, products possessing high yield points with good deformability at the same time can be produced both from hot strips and cold strips in the method according to the invention. It is then essential that cold forming be conducted with sufficient degrees of deformation to conclusion of production of the hot or cold strip.

[0009] Cold forming according to the invention can be conducted, for example, by final rolling or stretcher-and-roller levelling of the steel sheet or strip. In these cases the product produced according to the invention is a steel sheet or strip whose yield point regularly lies above 330 MPa.

[0010] Yield points that also reliably maintain this minimum value can also be achieved in that the cold forming formed according to the invention is part of a process for production of a finished component shape. Thus, the cold

forming consigned to the last step of the method according to the invention can be conducted by deep drawing, stretcher-and-roller levelling or hydroforming. It is then nearly essential that a sufficient degree of deformation be achieved, which lies above the degree of deformation common in conventional dressing.

[0011] It has surprisingly been found that starting from the steel alloy use according to the invention, a distinct increase in yield points occurs from the cold forming conducted at the end of the production process without subsequent annealing, without the occurrence of critical compromises to isotropy or ductility of the material. Thus, products produced according to the invention, especially sheets or strips, are characterized by an optimal combination of elongation at break and yield point. They also exhibit TWIP properties. They are far superior to light steel products with the usual composition produced in the usual manner. It is therefore possible with the method according to the invention to simply produce light steel products with the highest yield points that are characterized by good deformability at low weight.

[0012] The reliability with which the work result made possible by the invention is achieved can be improved by the fact that the degree of cold forming is at most 15%, especially at most 10%.

[0013] Hot strips or cold strips can be used as starting product for production of the steel products according to the invention. Hot strip production can then include the usual process steps. A steel with the composition according to the invention can be cast to slabs, thin slabs or cast strips. These preliminary products are then hot rolled to hot strips that are reeled into coils.

[0014] After reeling, the obtained hot strip can be cold deformed in the manner according to the invention directly to a product according to the invention. As an alternative the hot strip can initially be cold rolled to cold strip, which is then subjected to recrystallization annealing before it is again subjected to cold forming with degrees of cold forming amounting to 2 to 25% as the last step of the method according to the invention.

[0015] If reheating before hot rolling is required, especially during the use of slabs, the reheating temperature should not lie below 1100°C. On the other hand, in those instances in which the starting product is fed to hot rolling in a continuous process after casting, this can also occur without intermediate reheating in direct use.

[0016] By hot rolling the hot strip according to the invention with hot rolling temperatures amounting to at least 800°C and reeling it at low temperatures, the positive effect of the carbon and, if it is present, especially boron, is fully utilized. Boron and carbon cause higher tensile strength and yield point values with still acceptable breaking elongation values in sheet hot rolled in this range. With increasing hot rolling temperature tensile strength and yield point diminish, whereas the elongation values rise. By varying the rolling temperatures in the range stipulated by the invention, the desired properties of the obtained steel sheet can be deliberately and simply influenced.

[0017] By restricting the reeling temperature to values of a maximum of 700°C material embrittlement is reliably avoided. It could be found that formation of brittle phases can occur at higher reeling temperatures, which can entail material spalling, for example, and hamper further processing or even make it impossible.

[0018] If the steel product is produced from a cold strip, the degree of cold rolling during cold rolling that proceeds recrystallization annealing preferably lies in the range from 30 to 75% in order to reliably achieve the optimized deformation and strength properties of the finished steel product according to the invention.

[0019] The annealing temperatures during recrystallization annealing preferably lie between 600 and 1100°C. Hood annealing can then be conducted in the temperature range from 600 to 750°C or in a continuous annealing furnace at temperatures from 750 to 1100°C.

[0020] Owing to Si contents restricted to a content above 2.50 wt%, preferably above 2.70 wt%, steel sheets according to the invention have improved cold rollability in comparison with light steel sheets or sheets having lower Si content. High addition of Si manifests itself with more uniform yield point and tensile strength values, as well as higher breaking elongation and uniform elongation values. Silicon in the steels according to the invention also leads to higher r and n values, as well as isotropic formation of mechanical properties. The upper limit of the sum formed from the Al and Si contents lies at 12%, since a sum of Al and Si contents going beyond this limit would entail the hazard of embrittlement.

[0021] It surprisingly turned out that the deliberate addition of boron in the steels according to the invention can lead to an improvement in properties and production suitability. According to an advantageous embodiment of the invention it is therefore proposed that the steel have a content of boron. If boron is added to improve adjustment of the yield point and deformability, boron contents can lie in the range from 0.002 wt% to 0.01 wt%, especially 0.003 to 0.008 wt% for this purpose.

[0022] The favorable effects of alloying on the mechanical-processing properties of steel sheets according to the invention can be further supported by the fact that a minimum amount of 0.10 wt% carbon is detectable in the steel according to the invention.

[0023] Because of its special property spectrum, particularly well supporting and crash-relevant auto body components for vehicles can be produced from cold strip products produced in the manner according to the invention. These can be used at low weight for particularly effective protection of the occupants of a vehicle. Products produced according to the invention are characterized in this context by particularly high energy absorption capacity during suddenly occurring loads.

[0024] The low weight with simultaneously good deformability and strength also makes it possible to produce wheels for vehicles, especially motor vehicles from products produced according to the invention.

[0025] Components that are used in the field of low temperature technology can also be produced from products produced according to the invention. The favorable property spectrum of cold strip products produced according to the invention is retained even at the low temperatures common in cryogenic engineering.

[0026] The good absorption capacity achieved in the production method according to the invention makes the method according to the invention also particularly suitable for production of products used to produce protective elements intended for protection of loads that occur in pulse-like fashion.

[0027] The invention is explained below by means of practical examples.

[0028] A light steel with (data in wt%) 0.0070% C, 25.9% Mn, 0.013% P, 0.0006% S, 2.83% Si, 2.72% Al, 0.0045% N and iron as remainder as well as unavoidable contaminants, which include slight contents of Cu, Cr, Ni, As, Sn, Ti, V, Nb, B and Mg was cast to slabs.

[0029] The slabs were hot rolled after reheating to 1150°C to hot strip at a hot rolling temperature of 850°C and then reeled at a reeling temperature of 500°C. The hot strip was then cold rolled to cold strip with a thickness of 1 mm and a degree of deformation of 65%. After cold rolling the cold strip was subjected to crystallization annealing at a temperature of 950°C in a continuous process.

[0030] In this state the cold strip was isotropic. Its mechanical properties determined in the longitudinal direction are shown in Table 1 (degree of cold forming = 0%).

| Degree of cold forming (%) | $R_{p0.2}$ (MPa) | $R_m$ (MPa) | $A_g$ (%) | $A_{80}$ (%) | n | r |
|---|---|---|---|---|---|---|
| 0 | 326 | 657 | 52.8 | 58.8 | 0.373 | 0.93 |
| 2.5 | 400 | 675 | 47.5 | 53.4 | 0.307 | 0.90 |
| 5 | 464 | 699 | 41.8 | 48.2 | 0.257 | 0.85 |
| 10 | 568 | 748 | 30.9 | 40.5 | 0.199 | 0.80 |
| 30 | 870 | 1039 | 3.0 | 12.1 | - | - |
| 50 | 1051 | 1225 | 2.9 | 5.4 | - | - |

Table 1.

[0031] To demonstrate the effect of the invention, after recrystallization annealing, pieces of the cold strip with degrees of deformation of 2.5%, 5%, 10%, 30% and 50% were cold rolled. The mechanical properties determined for each of the pieces in the longitudinal direction are also shown in Table 1.

[0032] It was found that an optimal combination of elongation and yield points is achieved in a cold strip product obtained after final rolling if a degree of cold forming of 10% was maintained during final rolling of the cold strip. Thus, the yield point $R_{p02}$ could be increased by more than 70% and the tensile $R_m$ improved by more than 10% up to a degree of cold forming of 10%. The values for uniform elongation Ag, $A_{80}$ elongation, the r value and the n value then remained at a level lying well above the level achieved in conventional steels with a comparable yield point. Only at a degree of cold forming of 30% does a dramatic drop in elongation properties occur.

[0033] In another experiment an additional cold strip agreeing with the cold strip just explained in terms of its composition and the working steps consigned to conclusion of its recrystallization annealing was produced. From a section of this cold strip without conducting cold forming beforehand, a crash element with the shape of a hollow profile was then produced. Another piece of the recrystallization annealed cold strip, on the other hand, was cold-deformed in the manner according to the invention with a degree of cold forming of 7% by final rolling. A crash element in the shape of a hollow profile was also produced from the cold strip product produced according to the invention.

[0034] The two crash elements both weighing about 150 kg were then investigated with respect to their energy absorption capacity in a falling experiment in which they encounter an obstacle at a falling speed of 50 km/h. It was found that the crash element produced from the cold strip product subjected to final rolling according to the

invention had much better energy absorption capacity despite the fact that its wall thickness was significantly reduced relative to the other crash element because of the additional cold forming.

[0035] In a third experiment, a recrystallization-annealed cold strip was finally produced again based on the aforementioned composition and using the already explained process step. The cold strip so produced was then subjected to cold forming by stretcher levelling in the manner according to the invention. The degree of cold forming achieved in this case was again 10%. Because of this cold forming the yield point could be increased from 320 MPa in the state after only recrystallization annealing to 520 MPa after cold forming following recrystallization annealing. The tensile strengths rose at the same time from 640 MPa to 710 MPa. The r value was scarcely influenced. The elongation values diminish with increasing degree of deformation from 60% to about 50% and the n value from 0.39 to 0.27. However, these values were far above the elongation properties of n values that can be found in conventionally produced steel of the same yield point class of comparable high strength. During cold forming of the cold strip by stretch drawing the obtained product also therefore exhibited an optimal combination of yield point and elongation values.

## Claims

1. Method for production of a steel product, especially a steel strip or strip, with a high yield point,
– in which a steel strip or sheet is produced from a steel, which contains (in wt%):

| | |
|---|---|
| C: | ≤1.00%, |
| Mn: | 7.00-30.00%, |
| Al: | 1.00-10.00%, |
| Si: | >2.50-8.00%, |
| Al + Si: | >3.50-12.00%, |
| B: | <0.01%, |
| Ni: | <8.00%, |
| Cu: | <3.00%, |
| N: | <0.60%, |
| Nb: | <0.30%, |
| Ti: | <0.30%, |
| V: | <0.30%, |
| P: | <0.01%, |

and iron and unavoidable contaminants as remainder,
– from which the finished steel product is produced by a cold deformation occurring at a degree of cold deformation from 2 to 25%.

2. Method according to Claim 1, characterized by the fact that the degree of cold forming is at most 15%.

3. Method according to Claim 2, characterized by the fact that the degree of cold forming is at most 10%.

4. Method according to one of the preceding claims, characterized by the fact that the steel strip is cold deformed as a hot strip to the product.

5. Method according to one of the Claims 1 to 3, characterized by the fact that the steel strip is cold deformed to the product as a cold strip.

6. Method according to one of the preceding claims, characterized by the fact that production of the steel strip or sheet includes the following working steps:
– casting of the steel to a preliminary material, like slabs, thin slabs or cast strip,
– hot rolling of the preliminary material to a hot strip,
– reeling of the hot strip.

7. Method according to Claim 6, characterized by the fact that the preliminary material is reheated to at least 1100°C before hot rolling.

8. Method according to Claim 6, characterized by the fact that the preliminary material is used directly for hot rolling with a temperature of at least 1100°C.

9. Method according to one of the Claims 6 to 8, characterized by the fact that the final temperature of hot rolling is at least 800°C.

10. Method according to one of the Claims 6 to 9, characterized by the fact that the reeling temperature is 450 to 700°C.

11. Method according to one of the Claims 6 to 10, characterized by the fact that the hot strip is cold rolled to a cold strip,
that the cold strip is then subjected to recrystallizing annealing
and that the cold strip is finally cold deformed after recrystallization annealing.

12. Method according to Claim 11, characterized by the fact that recrystallization annealing is conducted at an annealing temperature from 600 to 1100°C.

13. Method according to Claim 12, characterized by the fact that annealing is carried out a hood annealing at an annealing temperature of 600 to 750°C.

14. Method according to Claim 12, characterized by the fact that annealing is conducted as continuous annealing at an annealing temperature of 750 to 1100°C.

15. Method according to one of the Claims 11 to 14, characterized by the fact that cold rolling is carried out with a degree of cold rolling from 30 to 75%.

16. Method according to one of the preceding claims, characterized by the fact that the steel contains more than 2.70 wt% silicon.

17. Method according to one of the preceding claims, characterized by the fact that the steel contains 0.002 wt% to 0.01 wt% boron.

18. Method according to Claim 17, characterized by the fact that the steel contains 0.003 to 0.008 wt% boron.

19. Steel sheet according to the one of the preceding claims, characterized by the fact that the steel contains 0.10 to 1.00 wt% carbon.

No drawings follow